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US 4601618 A

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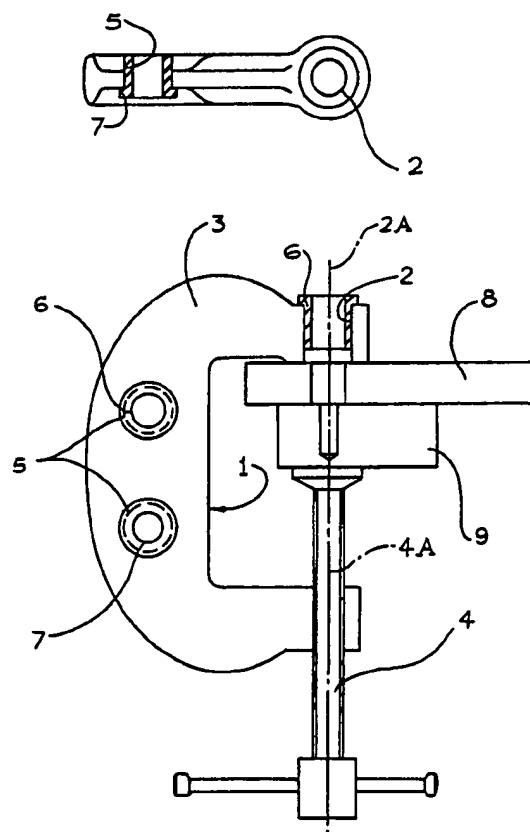
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(54) Drill clamp

(57) A drill clamp 1 comprises a first extending arm 3 and second extending arm opposing the first to define jaws. The first arm defining a contact area as one clamping member and the second arm serving to align a clamping member 4 for motion along a path towards and away from the contact area. A channel 2 extends through the first arm and having one end opening into the contact area, or a region adjacent thereto, the channel having or establishing an axis 2A whereby a drill or other cutting tool located by the channel is constrained to enter (at a predetermined angle relative to, or parallel to, or coaxial with the path) material 8, 9 clamped between the contact area and the clamping member. To aid alignment of the drill, bushes 6 may be inserted into the channel. The second clamping member may have a channel running its length to enable the drill to penetrate fully the workpiece. The clamp may have facility (Fig. 3) to store at least one drill bit and bush dedicated for use with that clamp.

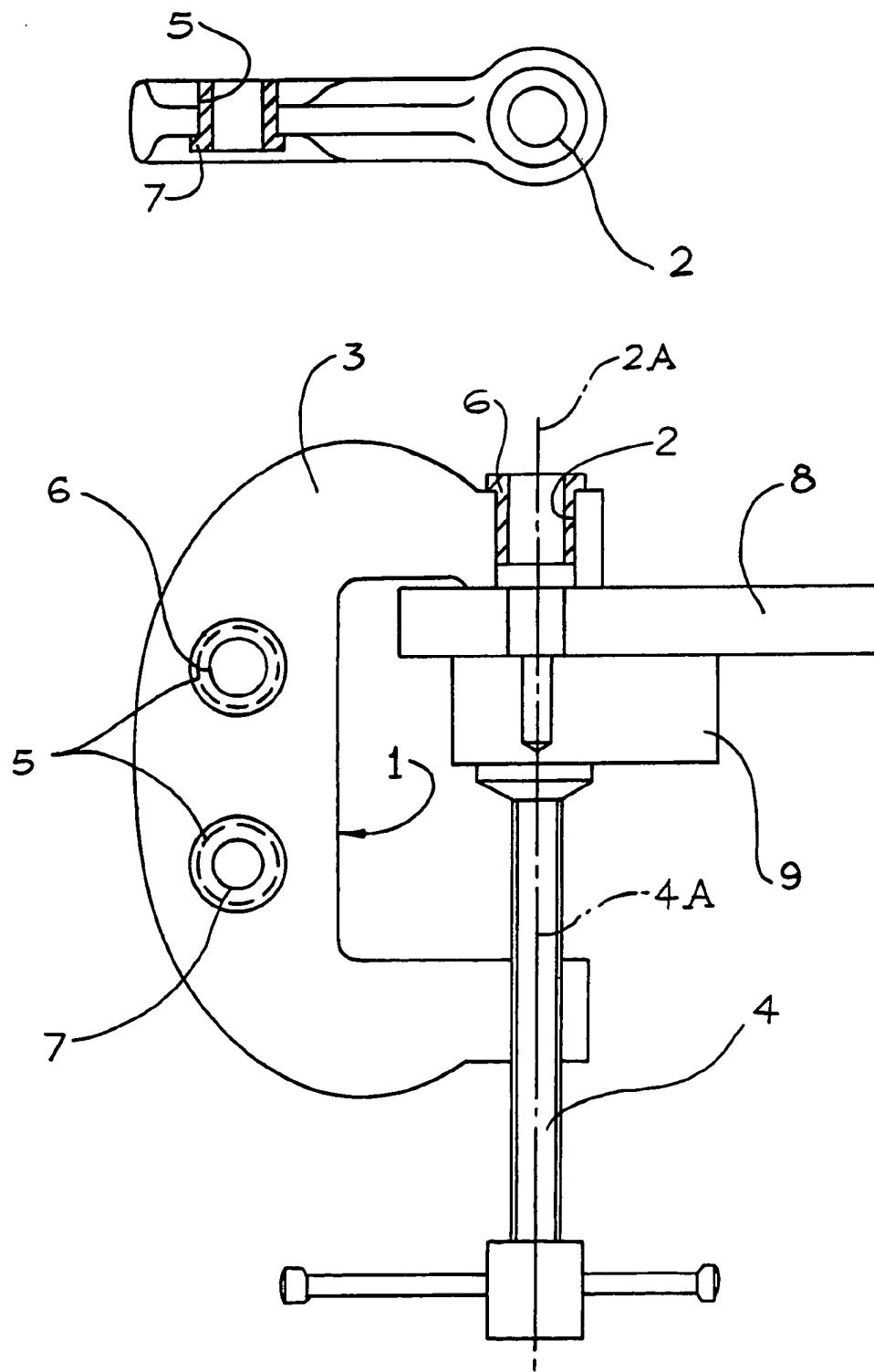
FIGURE 1



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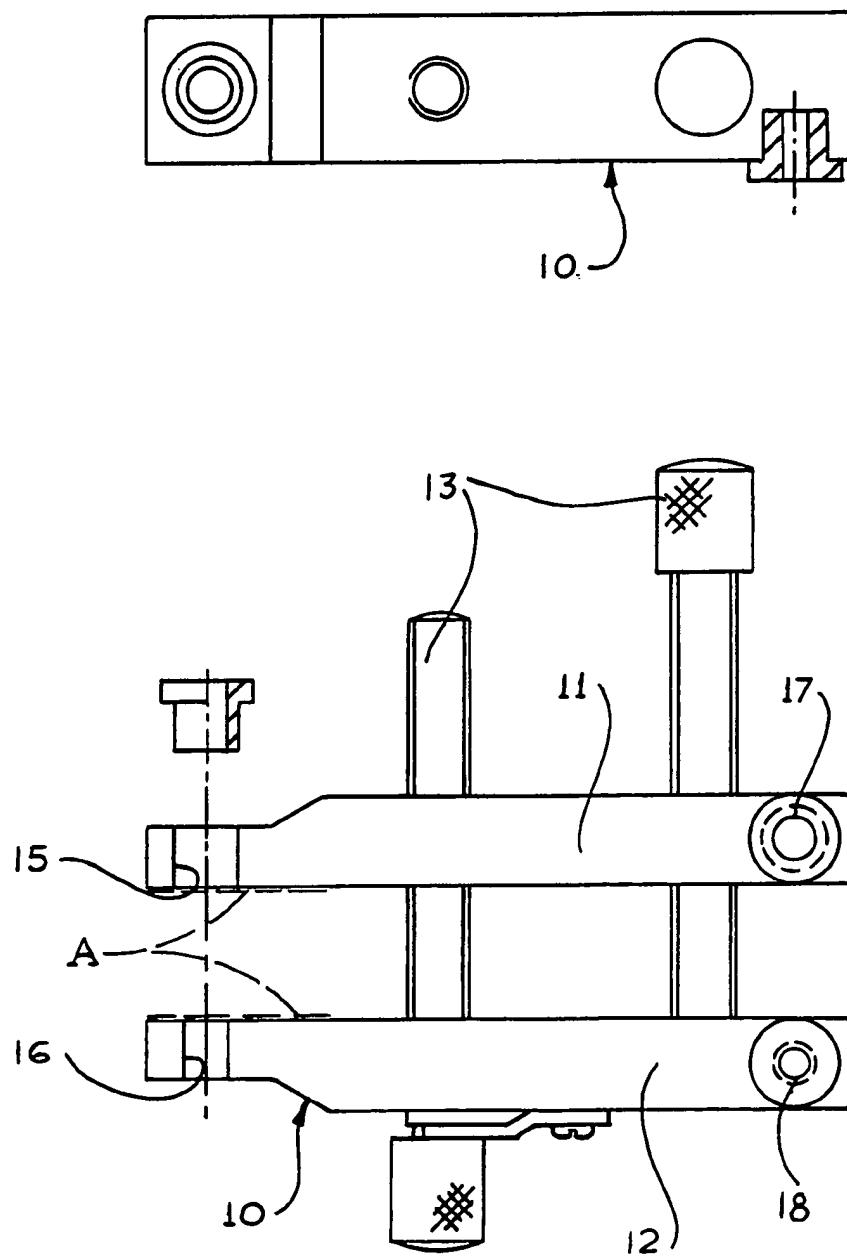
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FIGURE 1



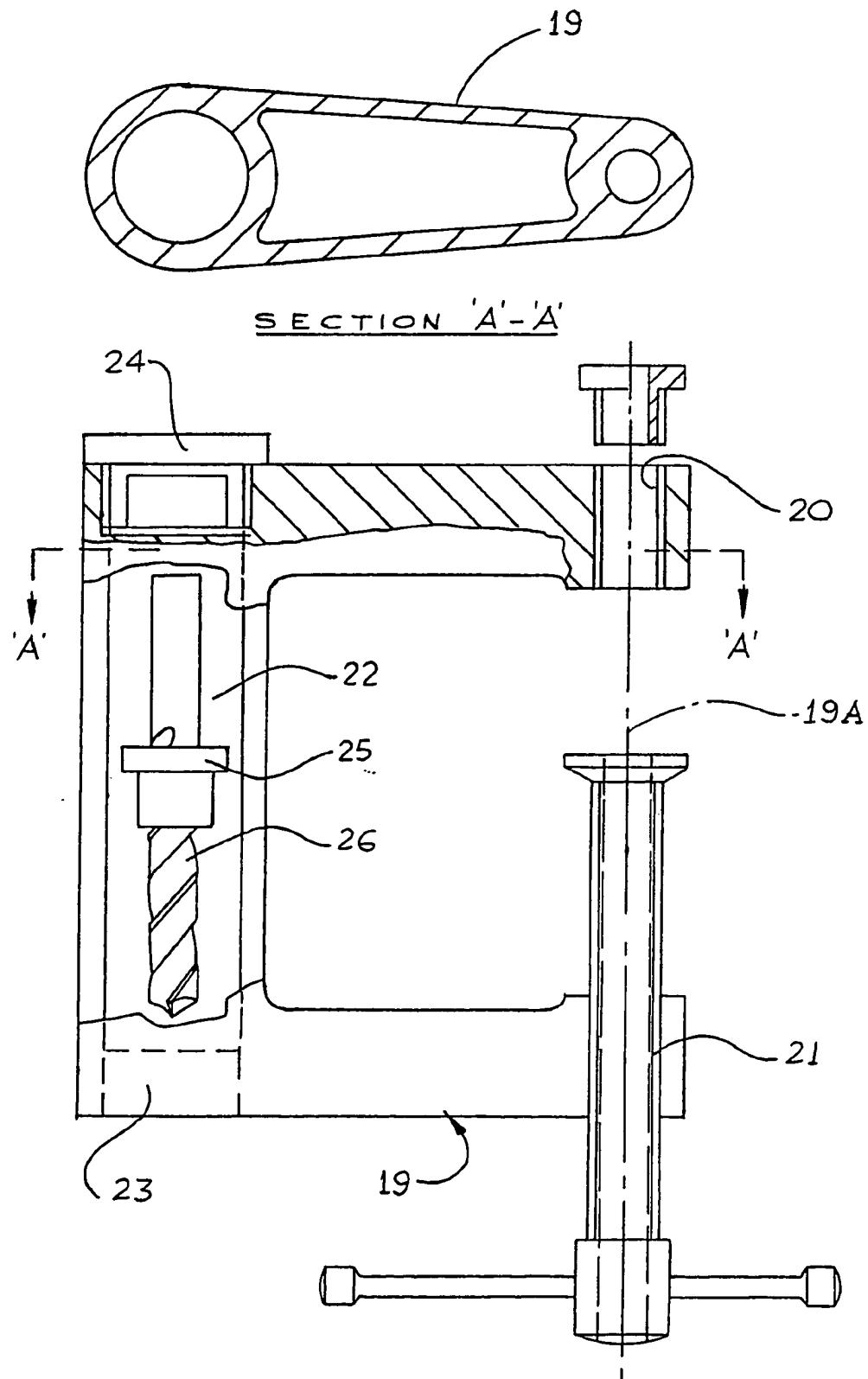
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FIGURE 2



3/3

FIGURE 3



DRILL CLAMP

Nut and bolt fasteners, rivets, and location devices such as dowels and tension pins are widely used in the engineering and construction industries.

The general use of these fastenings and location devices depends upon the provision of holes in the items to be joined.

It may be convenient where large numbers are involved for the holes to be punched during the basic manufacturing process. When parts are produced using a power press for example dedicated punches and dies of the appropriate size can be utilized to produce the hole.

Where fewer sub-assemblies are required the holes in each part may be drilled using drill jigs. These are well known tools, used to locate and hold a part, or a number of parts, relative to a pre-determined datum or combination of data, prior to a hole drilling operation. The datum lines or surfaces referred to are generally, but not exclusively, relate to the operational function of the part which is to be drilled. The manufacture of individual drill jigs requires detailed design knowledge, skilled personnel and involves various production techniques such as the hardening of materials. Their manufacture also involves the accurate use of complex and expensive machine tools.

Once made a drill jig is restricted in use to a single item or perhaps a small number of associated parts.

Where fewer sub-assemblies are required it remains common practice to measure and mark out holes individually in each item. This often involves the use of skilled labour and complex and expensive measuring equipment. Unfortunately due to a number of factors including operator error, an accumulation of

tolerances, and imperfect drilling, a satisfactory alignment of parts is not always achieved when they are subsequently fastened together.

These processes are seldom subject to inspection and frequently result in loss of time, materials and sub-standard assemblies.

It is also possible and sometimes desirable to clamp parts together before they are drilled. The human eye is an excellent comparator and parts can be aligned with great accuracy to check their combined fitness for purpose.

It is when parts are clamped and perfectly positioned that it would be convenient to drill the several parts together to provide an accurate location hole for the fastener. Clamps however are designed primarily to hold items by applying external forces and clamp arms tend to occupy the space where a fastening hole would be most effective.

According to the present invention there is provided a drill clamp comprising first and second extending arms together serving to define jaws for the clamp, the first arm serving to define a contact area facing into the jaws, the second arm serving to align a clamping member for motion along a path towards and away from the contact area characterised by a channel extending through the first arm and having one end opening into the contact area, or a region adjacent thereto, the channel having or establishing an axis whereby a drill or other cutting tool located by the channel is constrained to enter (at a predetermined angle relative to, or parallel to, or coaxial with the path), material clamped between the contact area and the clamping member.

According to a first preferred version of the present invention the channel serves of itself, or to accommodate a drill bush, to pilot or guide a twist drill or other cutting tool.

According to a second preferred version of the present invention or the first preferred version thereof the first arm serves to define at least one further channel extending through the first arm or an extension thereof and opening into the contact area, the further channel having or establishing an axis whereby a drill or other cutting tool located by the further channel is constrained to enter (at a predetermined angle relative to, or parallel to, or coaxial with the path), material clamped between the contact area and the clamping member.

According to a third preferred version of the present invention or any preceding preferred version thereof a bush is located in the channel by means of a flange or other projection seated on or positioned by that end of the channel opening into the contact area.

According to a fourth preferred version of the present invention or the first or second preferred versions thereof a bush located in the channel is located in the channel by means of a flange or other projection seated on that end of the channel remote from that end opening into the contact area.

According to a fifth preferred version of the present invention or any preceding preferred version thereof wherein the second arm provides a clearance volume in the region of that end of the channel opening into the contact area so that a drill or other cutting tool from the channel can break through a workpiece located in the jaws between the contact area and the clamping member without coming into contact with the clamping member.

According to the present invention or any preceding preferred versions thereof the drill clamp is provided with a body member providing for the storage therein of a drill or other longitudinal member for use with the clamp when it is used to clamp a workpiece between the clamping member and the contact area.

According to a second aspect of the present invention there is provided a workpiece fabricated by means of a drill clamp according to the present invention or a preferred version thereof.

The present invention acts to provide a clamp which exerts a clamping force through members referred to as 'arms' which can secure a variety of items of various size and shape. One or more channels are provided in one or both the clamp arms. Depending upon the particular size and shape of clamp it may be convenient for a further channel or further channels to be additionally or alternatively provided in extensions of the clamp arms. The longitudinal axis of the channel will generally, but not exclusively, lie parallel to the line of action of the clamping force.

The purpose of the channel or channels is to conveniently guide or otherwise directionally assist a hole making process in a part or number of parts secured by the clamp.

The provision of a suitable channel or channels to assist the drilling or machining process is not restricted to a particular style or type of clamp. The clamp configuration or design may use a screw, spring, cam, lever, hydraulic, electric, pneumatic or any other method to apply the clamping force.

The channel or channels are used typically to pilot or guide a twist drill. The same channel or channels can be plain or threaded. They may also be used to accommodate individual drill bushes of different internal diameters.

A specific embodiment of the invention will now be described by way of example with reference to Figures 1, 2 and 3.

Figure 1 shows a plan and a sectional side view of a typical clamp 1. A channel 2 is provided in the upper horizontal arm 3 of the clamp 1. In this example the

channel 2 is positioned so that its axis 2A is co-axial with axis 4A of clamp screw 4. This is regarded as the most convenient and effective location. In other arrangements one or more further channels can be positioned at some distance from the screw axis 4A on extensions of the arm 3. The vertical section of the clamp 1 may also have one or more holes 5 (one being shown in Figure 1) in areas of relatively low stress. These holes 5 may be plain or threaded and provide a temporary location for a large bore drill bush 6 and a small bore drill bush 7. Both drill bushes 6,7 have the same size outside diameter.

Figure 1 shows clamp 1 holding a workpiece comprising a top piece 8 and bottom piece 9 both being of wood. The top and bottom pieces have been correctly aligned and are to be drilled whilst held together by the clamp.1 The wooden items 8, 9 will subsequently be permanently connected by a wood screw.

In this example the small bore bush 7 is inserted into channel 2 and a small diameter drill guided by the bush 7 used to drill a small diameter, deep hole suitable for the screw thread through pieces 8 and 9. The small bore bush 7 is then withdrawn and returned to hole 5 and the large bore bush 6 inserted into channel 2 and used as a guide for a large drill to provide an appropriate size hole in upper block 8 for a top plain shank portion of a wood screw. The larger hole is required in the top piece of wood 8 only, but it is important for eventual alignment that it shares the same longitudinal axis as the smaller hole in the lower block 9. The use of the drill clamp and drill bushes in the manner described will ensure the necessary alignment of blocks 8 and 9 can be permanently maintained when the clamp 1 is removed and the parts 8 and 9 are secured to one another permanently with a wood screw.

Figure 2 shows a typical toolmakers clamp 10 which has a top clamp arm 11 and a bottom clamp arm 12. The relative position of arms, 11, 12 and the resultant clamping force between them is controlled by screws 13. In this arrangement it is convenient for the top arm 11 to have a channel 15 of one size and bottom arm 12

to have a channel of different size 16. These primary channels 15, 16 are located coaxially and centrally and normal to area A where the clamping force is transmitted. It is possible to make further different sized holes with this drill clamp by using additional, removable drill bushes 17, 18 shown in typical storage positions.

Figure 3 indicates a clamp 19 manufactured from material which has been extruded from a die, and profiled by laser or other machining process. The drill bush channel 20 and hollow clamp tube screw 21 are co-axial on axis 19A. A larger channel 22 is incorporated in the basic extrusion 19 being blanked off with plug 23. at one end. The other end uses a removable plug 24 to provide a temporary closure for the channel 22 so that it provides a convenient storage location for loose drill bushes 25 and a twist drills 26 of appropriate size.

In the embodiment shown in Figure 2 the channel 16 provides a relief opening so that a drilling tool directed along channel 16 to a workpiece clamped between arms 11, 12 can break through the workpiece without cutting into the arm 12. Likewise in the embodiment shown in Figure 3 the hollow clamp screw tube 21 also provides a relief bore for drilling through a workpiece.

CLAIMS

- 1 A drill clamp comprising first and second extending arms together serving to define jaws for the clamp, the first arm serving to define a contact area facing into the jaws, the second arm serving to align a clamping member for motion along a path towards and away from the contact area characterised by a channel extending through the first arm and having one end opening into the contact area, or a region adjacent thereto, the channel having or establishing an axis whereby a drill or other cutting tool located by the channel is constrained to enter (at a predetermined angle relative to, or parallel to, or coaxial with the path), material clamped between the contact area and the clamping member.
- 2 A drill clamp as claimed in Claim 1 wherein the channel serves either of itself, or by way of a drill bush, to pilot or guide a twist drill
- 3 A drill clamp as claimed in Claim 1 or Claim 2 wherein the first arm serves to define at least one further channel extending through the first arm or an extension thereof and opening into the contact area, the further channel having or establishing an axis whereby a drill or other cutting tool located by the further channel is constrained to enter (at a predetermined angle relative to, or parallel to, or coaxial with the path), material clamped between the contact area and the clamping member.
- 4 A drill clamp as claimed in any preceding claim wherein a bush located in the channel is located in the channel by means of a flange or other projection seated on or positioned by that end of the channel opening into the contact area.
- 5 A drill clamp as claimed in Claim 1, Claim 2 or Claim 3 wherein a bush located in the channel is located in the channel by means of a flange or

other projection seated on that end of the channel remote from that end opening into the contact area.

- 6 A drill clamp as claimed in any preceding wherein the second arm provides a clearance volume in the region of that end of the channel opening into the contact area so that a drill or other cutting tool from the channel can break through a workpiece located in the jaws between the contact area and the clamping member without coming into contact with the clamping member.
- 7 A drill clamp as claimed in any preceding claim provided with a location providing for the releasable mounting of a drill bush or other component when said bush or component is not in use in the channel.
- 8 A drill clamp as claimed in any preceding claim having a body member providing for the storage therein of a drill or other longitudinal member for use with the clamp when it is used to clamp a workpiece between the clamping member and the contact area.
- 9 A drill clamp as claimed in any preceding claim wherein the clamping member is adapted for displacement to provide for the application of a clamping force by mechanical, hydraulic, electrical, or pneumatic means.
- 10 A drill clamp as hereinbefore described with reference to and as illustrated in Figure 1, Figure 2 or Figure 3 of the accompanying drawings.
- 11 A workpiece fabricated by means of a drill clamp as claimed in any preceding claim.

Relevant Technical Fields

(i) UK Cl (Ed.M) B3C; B4W
 (ii) Int Cl (Ed.5) B23B; B25B

Search Examiner
H F YOUNGDate of completion of Search
4 NOVEMBER 1994

Databases (see below)

(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii) ONLINE DATABASES: WPI

Documents considered relevant following a search in respect of Claims :-
1 TO 11

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
X	GB 2120584 A	(GKN) see Figures 1 and 2	1 to 6, 9, 11
X	GB 1572176	(WEBSTER) see Figure 1	1, 2, 6, 9, 11
X	EP 0143871 A1	(WOLFF) see Figure 7 and note holes 73, 74, 75 in arm 76	1, 2, 3, 9, 11
X	US 4601618	(BOEING) see figures	1, 2, 6, 9, 11

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).